CASE REPORTS

Surgical Treatment of Traumatic Rupture of the Thoracic Aorta and Diaphragm

DENNIS F. PUPELLO, M.D.,
JAMES B. D. MARK, M.D.,
AND ALBERT B. IBEN, M.D., *Stanford*

TRAUMATIC LACERATION of the thoracic aorta secondary to blunt trauma of the chest is occurring with increasing frequency. Deceleration injury, such as that encountered in auto accidents at high speed, seems to be the major factor. Fewer than 15 percent of patients with this injury survive to reach a hospital.[1] Early diagnosis of the problem is mandatory and nonoperative management is uniformly associated with a high mortality. Since the first successful repair in 1959[2] there have been approximately 30 surgical cases reported.[3] The following is the first report of successful repair of traumatic ruptures of the thoracic aorta and left hemidiaphragm.

Report of a Case

A 21-year-old man was admitted to the Santa Clara Valley Medical Center 25 October 1968 on transfer from another hospital two hours after injury in an automobile crash at high speed. At the other hospital an x-ray film of the chest showed a widened mediastinum. On admission the patient

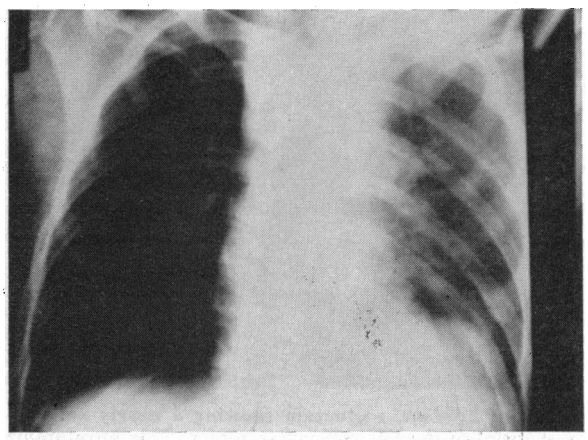

Figure 1.—Preoperative x-ray film showing widened mediastinum and elevation left of hemidiaphragm.

was awake and alert. The extremities were pale and cool. There were superficial lacerations of the face and scalp and he complained of pain in the back and left chest. The blood pressure in the left arm was 136/72 mm of mercury and the pulse was 120 and regular. The peripheral pulses were palpable although those in the lower extremities were weak. Auscultation of the chest disclosed normal breath sounds on the right and decidedly decreased breath sounds on the left. A loud systolic bruit with radiation to the back was audible just below the left mid-clavicle. The left upper abdominal quadrant was tender to palpation but rebound tenderness was absent. Bowel sounds were normal. Results of neurological examination were entirely within normal limits. A radiograph disclosed a wide mediastinum, multiple rib fractures on the left and an elevation of the left hemidiaphragm (Figure 1). Urinalysis showed 1+ protein, 4+ glucose with 20 to 30 erythrocytes per high-power field. The hematocrit was 37 percent and leukocytes numbered 27,000 per cu mm. Serum electrolytes were within normal limits. Approximately an hour after admission, an emergency retrograde aortogram using a percutaneous femoral approach was performed. This study disclosed an intraluminal filling defect and traumatic aneurysm in the descending aorta just

From the Department of Surgery, Stanford University School of Medicine, Stanford, and the Santa Clara Valley Medical Center, San Jose.

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Reprint requests to: Division of Cardiovascular Surgery, Stanford University School of Medicine, Stanford, Ca. 94305 (Dr. Pupello).

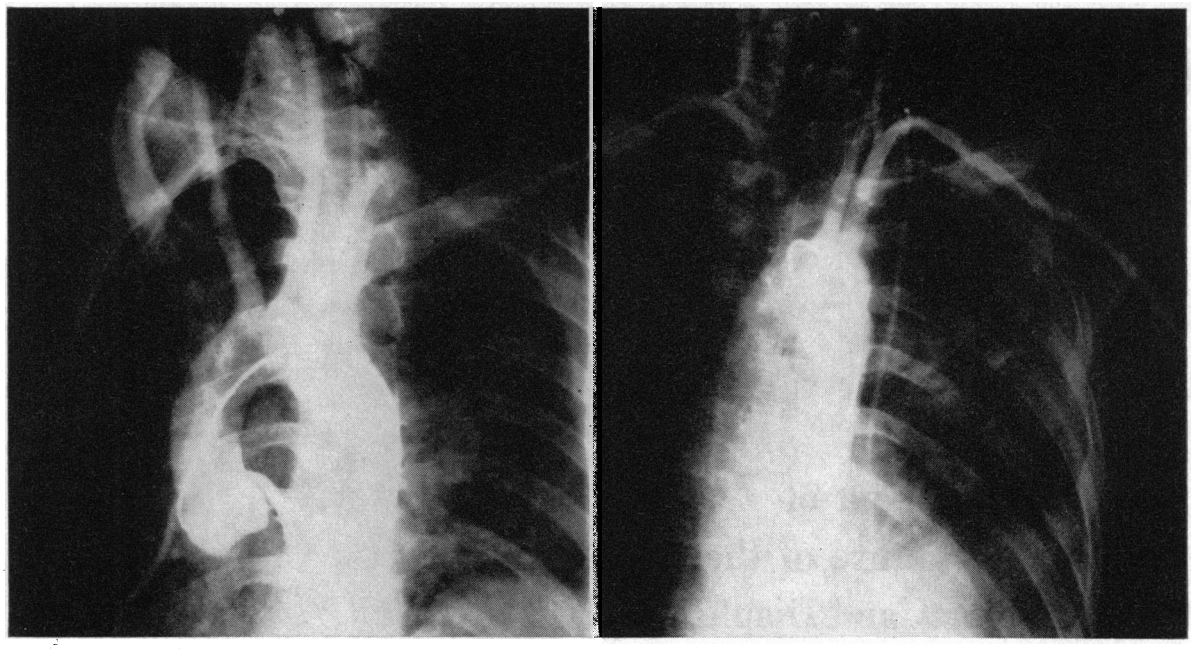

Figure 2.—*Left*, aortogram showing a nearly vertical thin radiolucent line within a collection of contrast medium just distal to the left subclavian artery. This intraluminal filling defect represents an intimal tear (left-posterior-oblique projection). *Right*, view from front showing traumatic aneurysm in the descending aorta.

below the left subclavian artery (Figure 2). Vital signs remained stable throughout the procedure.

The patient was then transferred to the operating room where left femoral vein to femoral artery by-pass was effected while simultaneous left thoracotomy was being performed. An oblique 3 cm tear of the aorta was found just distal to the left subclavian artery. The traumatized section of aorta was excised and replaced with a dacron tube graft. The partial by-pass time was 44 minutes. A tear in the left hemidiaphragm extending from the xiphoid process to the aortic hiatus was closed with interrupted nonabsorbable sutures reinforced with a running suture of 0 chromic catgut. Except for transient weakness in the left lower extremity, the postoperative course was uneventful. The tubes were removed from the chest on the third postoperative day and the patient was discharged on the 13th postoperative day. At last report, 6 months after operation, he was asymptomatic and the blood pressure was within normal limits.

Discussion

With the increased number of high speed automobile accidents, rupture of the aorta as a result of abrupt deceleration is increasing. Greendyke[4] reported that one of every six persons who died as a result of an automobile accident in Monroe County, New York, during the years 1961 through 1965 had aortal rupture. This injury occurs in all age groups but is most common in young men.[5] Approximately 80 percent of all traumatic ruptures occur at the level of the ligamentum arteriosum.[6] In contrast to the old theory of a relative fixation of the aortic arch with a mobile descending aorta, recent evidence suggests that the descending aorta is anchored by the adjacent soft tissue, intercostal vessels and pleural reflections while the arch is quite mobile.[7] At the level of the ligamentum arteriosum the aorta is bound firmly to the prevertebral fascia by dense fibrous connective tissue.

The physical findings in patients with disruption of the thoracic aorta may be misleading, for there may be little or no external evidence of chest injury. When there is a history of deceleration trauma associated with widening of the mediastinum on an x-ray film, aortography is indicated. If a tear is demonstrated, surgical repair should be done immediately. Successful treatment is dependent upon early diagnosis. The primary obstacle to success is failure to recognize the problem.

With reference to traumatic rupture of the diaphragm, Ambroise Paré described the characteristic signs of this injury in 1579 as severe pain and disturbance of mechanical respiration. The diagnosis is often delayed because the injury may be

overshadowed by the pain of abdominal visceral lacerations or rupture, and chest wall trauma. This injury is also increasing in frequency and automobile accidents head the list of causative factors.[8,9]

Summary

A case is reported in which rupture of the thoracic aorta in a man injured in an automobile crash was successfully carried out.

Traumatic rupture of the thoracic aorta and diaphragm is more common than appreciated. Aortography is essential when there is a history of chest trauma and widening of the mediastinum is seen on x-ray examination. A high index of suspicion and emergency operative intervention, using partial cardiopulmonary by-pass, may raise the low salvage rate of those patients who live long enough to reach a hospital. In addition, thorough exploration of the chest at the time of operation may occasionally disclose a diaphragmatic laceration previously unappreciated.

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LIGHT THAT BLESSES AND BLURS

"Light is a very interesting commodity. As we grow older, light becomes a two-edged sword that works for us and works against us. Because of the increased sclerosis within the media of the eye, there is a great deal more internal scatter. So we get a lot of glare if the light comes into the eye; but at the same time, we need more light on the material that we are reading. So a properly directed light is a very great help.

"I'm sure that as ophthalmologists you've all run into this experience: you prescribe reading glasses for a patient and record that he is able to read Jaeger 1; and yet the person calls up and says that he can't see with his new glasses. You're only human so you call him back to the office and with the very same glasses, he reads Jaeger 1 and says, 'How come I can read it here, but I can't read it at home?' It's largely because most of us use some form of a gooseneck lamp over our chairs; and in effect what we're getting is a concentration of light on the target, and the shade is preventing a good deal of the backlash of the light into the eye. So showing the person how to use a light is very helpful.

"This is particularly true in people who have incipient cataracts. The blur that goes with incipient cataracts is very much like the spots of dirt on the windshield of your car. The sun hits your windshield a certain way and the windshield is perfectly clean; if it hits another way, you have trouble seeing. If a person is aware of how to work his lights, he can avoid this sort of thing."

—ALBERT E. SLOANE, M.D. Boston

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